Title: The Missing Monkey Mystery

Brief Overview:

This lesson introduces the concept of finding missing numbers in number sentences (equations). It is expected that students are familiar with addition facts to 10, writing number sentences, adding three addends, and the following vocabulary: *addend, equal, and sum.* During this lesson the students will help the monkey trainer figure out how many monkeys are missing and increase their knowledge of addition facts to 18.

NCTM Content Standard/National Science Education Standard:

Use mathematical models to represent and understand quantitative relationships.

- Model situations that involve the addition of whole numbers, using objects, pictures, and symbols.

Grade/Level:

Grade 2

Duration/Length:

3 sessions, for 60 minutes a session.

Student Outcomes:

Students will:

- Find the number of missing objects, given a sum and one addend.
- Use data in pictures to help find missing numbers in number sentences.
- Find the missing addend given a number sentence with one addend and the sum.

Materials and Resources:

Day 1

- 1 sticky note for each student.
- Student Resource 1A, "Trixie's Letter"
- Student Resource 1B, Picture of Trixie
- Student Resource 2A, "Missing Monkeys" Direction Sheet
- Student Resource 2B, Monkey Cards (Copy 3 pages per pair)
- Prepare 15 bags of…
    - Student Resource 2B, Monkey Cards, 10 cards per bag.
      *Note: For the enrichment, students will need 18 Monkey Cards.
    - Student Resource 2A (directions).

- Student Resource 3A, “Capture the Monkeys” directions, one per pair of students
- Student resource 3B (cage, one per pair of students)
- Cup, one per pair of students
- Cubes, 18 per pair in a bag
- Prepare 15 bags of… (Labeled “Capture the Monkeys”)
    - Student Resource 3A, “Capture the Monkeys”
    - Student Resource 3B (cage)
    - Cup
    - 18 cubes
- Student Resource 4A, “What If…?” transparency
- Teacher Resource 1
- Student Resource 4B, 1-10 Pinch Cards (Copy 2-sided and cut on dotted line.)

Day 2

- 17 Monkey Cards (for teacher only)
- Student Resource 5, “What’s the Addend?” explore (1/2sheet per pair of students)
- Sentence strip saying “Is the same as”
- Student Resource 6A, “Balancing Bananas” (Laminate if possible, one per pair of students) Place about 5 sticky notes (1/2 inch by 2 inches- the perfect size for a number sentence- on the line under the words “number sentence.” Also make 1 transparency of Student Resource 6A for teacher
- Two-color counters
- Student Resource 6B, “Balancing Bananas” Directions (1/2 sheet per pair of students)
- Student Resource 6C and 6D, “Balancing Bananas” Cards (Cut. Copy 6C onto color 1 and 6 onto color 2.) One of each color per pair of students.
- Prepare 15 bags of…
    - Student Resource 6A
    - Student Resource 6B
    - “Balancing Bananas” cards
    - 36 two-color counters
    - Dry erase marker
    - Erasers (tissues)
- Student Resource 7A, “Banana Solve and Swap” student directions, one per pair of students.
- Student Resource 7B, 7C, and 7D, 15 “Banana Solve and Swap” cards (Copy, fold down the center line, laminate, cut to create flash card with answer on back. Front of card is question, back of card is answer.) For 30 students, make a class set by copying 2 of each 7B, 7C, and 7D, each student gets one card.

Day 3

- Magic Monkey Machine (box, hat, scarf, etc.)
- Student Resource 8, “Magic Monkey Machine” cards (4 cards) Copy, fold down the center line, laminate, cut to make flash card with answer on back of card. Front of card is question, back of card is answer, one per pair of students.

- Dry erase boards, dry erase markers, and erasers (tissues), one each per student.
- Student Resource 9, "Missing Number Exploration" (1/2 sheet per pair and a transparency)
- Teacher Resource 2, Student Resource 9 Answers
- Prepare a bag for each pair of students with:
    - Student Resource 10A, "Monkey Memory Missing Numbers" (Color 1)
    - Student Resource 10B, "Monkey Memory Number Sentences" (Color 2)
- Lined chart paper
- Teacher Resource 2, "Sample BCR"
- Student Resource 12A and 12B, "Missing Monkey Mystery Summative Assessment"
- Teacher Resource 2, "Missing Monkey Mystery Summative Answer Key"
- Student Resource 11A and 11B, "Missing Number Masters"
- Teacher Resource 2, "Missing Number Masters" Answers

Development/Procedures:

Day 1

- Pre-assessment
  Give each student a sticky note to solve the following problem. Write the following problem on chart paper. "Charlie has 9 apple slices on his lunch tray. He gets up to get a napkin and when he returns, he only has 4 slices on his lunch tray. How many apple slices are missing from Charlie's lunch tray?"

  Ask students to write a number sentence to show how they solved the word problem. Have the students place the sticky note in his/her desk until the end of the lesson.

- Engagement
  See Student Resource 1A "Trixie's Letter." Read the letter from the circus trainer to the class.

- Exploration
  Provide each pair of students with a bag titled **"**Missing Monkeys" containing Students Resource 2A and 2B. Model how to play the game, but don't teach the students how to find the missing number. Have students play "Missing Monkeys." Take anecdotal notes while observing how students apply their own problem solving skills.

- Explanation
  Call students to the gathering space. Tell students to turn and talk with their partner about how they decided how many monkeys were missing. Have students share how they figured out how many monkeys were missing. Record student responses on chart paper.

- I looked at how many monkeys were there and counted on to 10.
- I know 5+5 is 10. I saw 5, so I knew my partner hid 5 cards.

Ask: What's another way to make 10? Confirm and clarify student responses as they share. Use the "Missing Monkeys" game to model how to use the "count on" strategy to find the missing number. Practice a few times up to 18.

Write this rhyme on chart paper: "Trixie, Trixie, some of the monkeys are gone. To solve this problem, we must count on." Have the students chant the rhyme to reinforce the strategy.

- Application
  Give student pairs the prepared bags with student resource 3A and 3B. Model how to play "Capture the Monkey." Have the students play "Capture the Monkey" as you informally observe the students using the taught "count on" missing number strategy. (Anecdotal notes)

  If students are struggling with the sum of 18, reduce the number of cubes.

- Differentiation
  - Reteach
    Lead small group in playing "Capture the Monkey." Use counters to fill in the space left by the missing monkeys as the students count on to the sum. Provide students with a blank frame with 18 spaces. Place cubes they have, one per space. Use the "count on" strategy to count the empty spaces.

  - Enrich
    Have students play "Missing Monkeys" with a partner. Before they play, give them 18 monkey cards.

- Assessment
  Display a transparency of Student Resource 4A, "What If…?" Read the first problem with the class. Have students use pinch cards to show how many monkeys are missing for questions 1-4, Student Resource 4B. Display and have students answer one question at a time. Make notes of students who still need reteaching.

  Have students summarize the lesson by reviewing how to use the "count on" strategy to find the missing number. Revisit the problem about Charlie's apples and give students a chance to change their answers. Share the solution together. Any of the following number sentences are acceptable: $4 + 5 = 9$, $5 + 4 = 9$, $9 – 5 = 4$, $9 – 4 = 5$.

Day 2

- Engagement

  Call students to the gathering space. Review what was taught yesterday with the "count on" missing number strategy. Chant the rhyme with the students a few times.

  Tell students that you will be showing them a number trick. Place a set of 17 monkey cards on the floor. Call a volunteer to the front. Tell the volunteer to take some of the Monkey Cards and hold them behind his/her back. Tell the class you won't peek. Tell the class you will be able to guess how many cards the volunteer is hiding behind his/her back.
  Say: I will be able to read your mind. Keep repeating the number of cards you have in your head, so I can read your mind.

  Announce how many objects are behind your back by subtracting, in your head, the number of cards on the floor from 17. Have the students turn and talk to a partner to see if they can figure out how you did the trick. The children should say, "You counted on from the number on the floor up to 17." Ask "Was it magic or math?" Have a student explain the math behind behind the magic. Choose a student to take your place and do the trick.

- Exploration

  Tell students to go to their seats. Ask students if they know what a balance is. Give students a copy of Student Resource 5, "What's the Addend?" Tell students to work with the person next to them to try and make the bananas balance by having the same amount of bananas on each side.

  Tell the students that there are three bananas on the left side of the scale with some missing, the empty box. Tell the students that the right side of the balance has 12 bananas. They will need to find the number that makes the scale balance by finding the number that goes in the empty box. Allow students to use a supply of color counters if needed. Tell them to talk to their partners about how to figure out how many bananas should go into the box to make the scale balanced.

- Explanation

  Tell students to come to the gathering space. Tell students to share how they decided how many bananas were missing with another partner. Show Student Resource 5, "What's the Addend?" on the overhead. Ask a student to come to the overhead to explain how he/she decided how many bananas go in the box. Students should say, "I started with 3 and I counted on to 12. My answer was 9."

Tell students that they are being introduced to the concept of algebra and equations. Say: This is something that 5th grade students do, but you are so smart that I am going to do this with you!

Say: The middle of the balance is like an equal sign in an equation or number sentence. The equal sign tells that both sides of the number sentence are the same, or equal. When you see an equal sign today, you are going to say, "Is the same as." Show students the Sentence Strip that says, "Is the same as." Give the students the number sentence, 5+3=8. Tell them that they can say, "Five plus three *is the same as* eight." Ask students: What are other ways to make 8?

Say to students: Today you will play a game to help Trixie feed the monkeys. She needs to feed them the same amount. Tell students: The object of the game is to get the bananas to balance. There should be the same number on both sides. Model the game as you think aloud. Place transparency of Student Resource 6a on the overhead.
Say: If I have 4 bananas on the left side of the balance, and I have 12 bananas on the right, I know some bananas are missing from the left. I will use my counters to count on to 12. I know that 8 bananas are missing.

Next I will write a number sentence below using the number of bananas on the balance. Write 4 + 8 = 12 on the top sticky note. Remind students to remove the sticky notes for each new problem.

Chant the rhyme again.

- Application
  Provide each pair of students with a bag titled "Balancing Bananas" including 36 two-color counters, the directions for the game (Student Resource 6B), and banana cards (Student Resource 6C and 6D).
  Have students play "Balancing Bananas." **Allow students to take more sticky notes as needed.**

  Take anecdotal notes while observing how students apply their own problem solving skills. As you walk around the room, use the completed sticky notes as a quick assessment for correct answers and to decide who needs reteaching.

- Differentiation
  - Reteach
    Lead small group in playing "Balancing Bananas." Use counters instead of the banana cards to fill in the number given and count on with counters to find the missing number.

- Enrich
  Bring the Enrich group to the carpet and quickly model playing "Balancing Bananas" with an additional addend. Students should not need counters at this point. See if they can use mental math or if they can find a "Balancing Banana" card that makes the number sentence complete.

- Assessment (Ongoing formative assessment for Day 2.)
  Tell Students that they will be using their knowledge of counting on to find the missing number by playing "Banana Solve and Swap." Give each student a "Banana Solve and Swap" card. See Student Resource 7A for "Banana Solve and Swap" directions and Student Resource 7B-D for the cards.

Day 3

- Engagement
  Use the "Magic Monkey Machine" to scaffold students' understanding from the concrete representation to the abstract (Student Resource 8). Tell students to come to the gathering space with their dry erase board, marker, and tissue. Show them the "Magic Monkey Machine." This is where you will hide the Monkey Cards.

  Show the front of the first card where the empty box is. Tell the class that you will put the Monkey Card into the "Magic Monkey Machine" and it will turn the card into a number sentence and will reveal the missing number! Tell students that they will need to think of the correct missing number and other ways to make the sum while the magic Monkey Machine is working.

  Do this with 3 other cards. Kids should be excited to work at this point!

- Exploration
  Tell students to find the missing numbers on Student Resource 9, "Missing Number Exploration." Tell students to work with a partner to fill in the missing numbers.

- Explanation
  Call students to the gathering area. Have students turn and talk about the strategy they used to find the missing number. Confirm or clarify.
  Tell students that they will continue to use the count on strategy to find the missing number.

  Tell students that Trixie needs their help again. The monkeys took and hid the deck of cards she was going to use for a trick and they mixed them up. Model how to play "Monkey Memory" using Student Resource 10A and 10B and the think aloud strategy.

Say: I have a card with the number sentence 15 = 3 + . I need to know the number that is missing from the box. I am going to use the count on strategy to solve the problem. So I start at 3 and count on to 15. 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15. I got it! I am holding up eight fingers. The missing number is 8 and now I have to look for a card with an 8 on it. Now it's my partner's turn.

- Application
  Have students play "Monkey Memory" with a partner.

  At the end of game playing, bring students to the gathering area. Tell students: We are going to write a class brief constructed response (BCR). A brief constructed response is a third grade term for writing your thinking for how you solved the problem. Sometimes it is just showing your work. Other times, you might have to write words to explain your thinking. Pictures, labels, symbols, numbers and words can be included in your thinking. We are going to write a BCR to explain how we solved a problem from 'Monkey Memory'."

  Write the BCR with help from the class on chart paper. See Teacher Resource 2 for the sample class BCR.

- **Differentiation**
  - Reteach
    Lead a small group and play "Monkey Memory" with counters as well as cards. Some students might need to physically touch the counters to count on to find the missing number.

  - Enrich
    For an additional challenge, see Student Resource Sheet 11A and 11B, "Missing Number Masters." Students will solve for the missing number given two addends on both sides of the equation. For Example, 4+ __ = 10+6. Students will complete a BCR also. Students will use what they know about missing number strategies to explain how they determined the missing number. Use numbers, words, pictures, and/or symbols.

Summative Assessment:

The students will fill-in the missing addend of a number sentence using basic facts. The students will solve real world problems using missing number strategies. The students will answer a BCR based on the knowledge of missing number strategies (Student Resource 12A-B).

*Read aloud test directions.

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Trixie's Letter

Dear Ms./Mr. _____'s Second Grade Class,

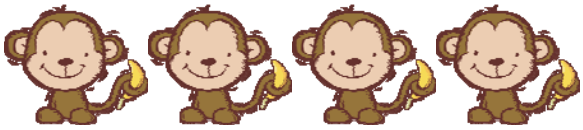
Hi! My name is Trixie. I am a trainer for the Monkey Brothers Traveling Circus. I need your help. I have many animals in my care. I was wondering if you could help me watch the monkeys while I am training the other animals. It would be a simple job. You just need to make sure the monkeys stay in their cages. There is always the same amount of monkeys in each cage.

I will meet you in front of the animal tent and introduce you to the monkeys. So that you are prepared for your new job, I am sending your teacher several games for you to play that will prepare you for your job. Good luck in your preparations. I will see you in two days.

Your friend,

Trixie

Trixie



Missing Monkeys

Materials for each pair of students:
10 monkey cards

Directions:

1. Place cards on a flat surface face up.
2. Partner #1 will close his/her eyes, while Partner #2 takes some monkeys and hides them behind his/her back.
3. Partner #1 will open his/her eyes and tell Partner #2 how many monkeys are missing. Check to see if you were right.
4. Repeat steps 1-3 while taking turns.

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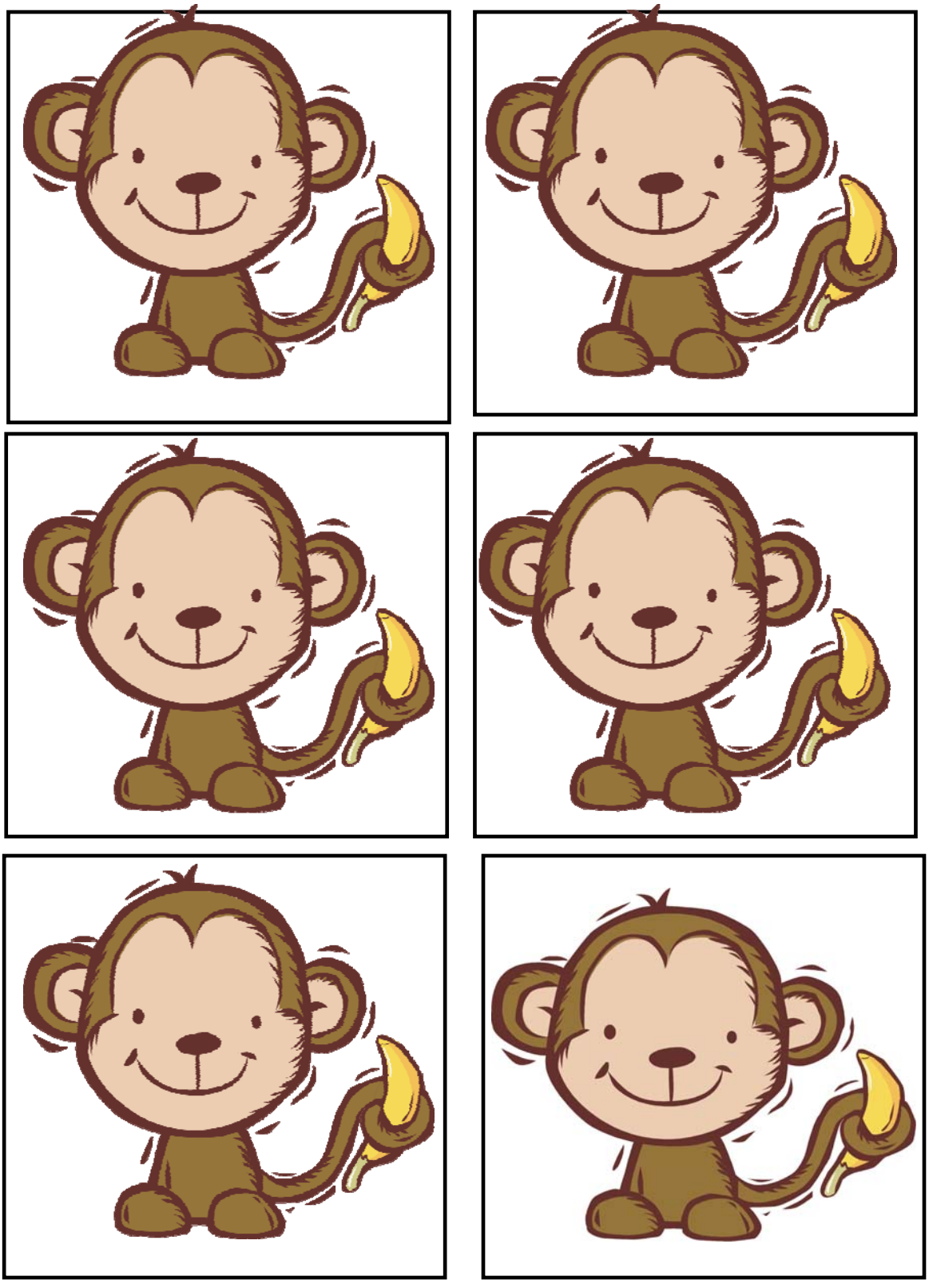
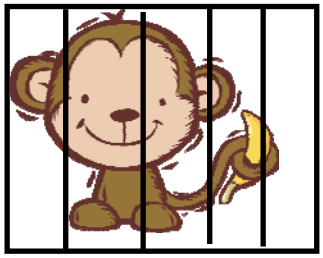


Capture the Monkeys

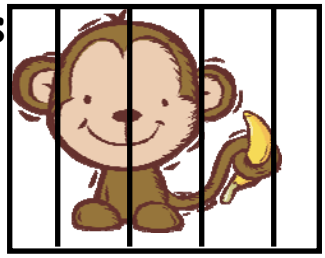


Materials for each pair of students:
Paper cage
Cup
18 cubes

Directions:

1. Place 18 cubes into the cup. Partner #1 will gently shake the cup and spill some of the cubes onto the cage.
2. Partner #2 will tell Partner #1 how many cubes are left in the cup.
3. Use the count on strategy. Check to see if you are right.
4. Repeat steps 1-3 while taking turns.

Capture the Monkeys

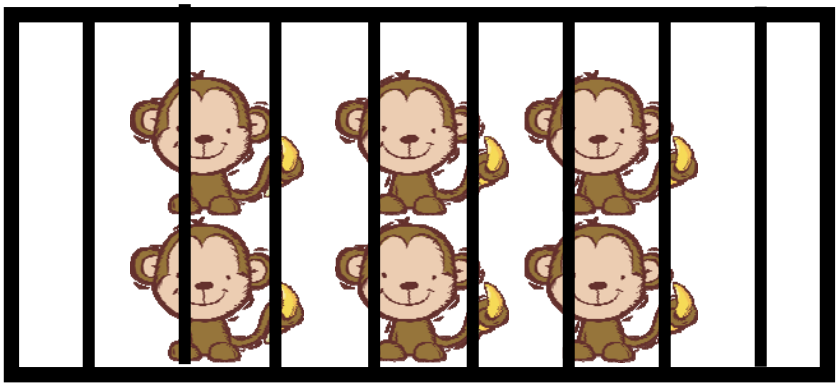


Materials for each pair of students:
Paper cage
Cup
18 cubes

Directions:

1. Place 18 cubes into the cup. Partner #1 will gently shake the cup and spill some of the cubes onto the cage.
2. Partner #2 will tell Partner #1 how many cubes are left in the cup.
3. Use the count on strategy. Check to see if you are right.
4. Repeat steps 1-3 while taking turns.

What If….?



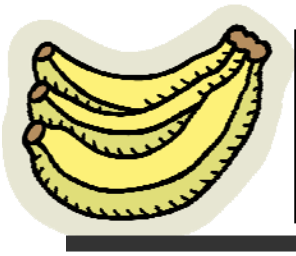
Imagine you are watching your assigned monkey cage and you notice that there are 6 monkeys. For each problem answer the following question:

How many monkeys are missing?

1. What if there should be 10 monkeys in the cage? *monkeys* ☐ *monkeys*	2. What if there should be 12 monkeys in the cage? ☐ monkeys
3. What if there should be 15 monkeys in the cage? ☐ monkeys	4. What if there should be 11 monkeys in the cage? ☐ monkeys

2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

What's the Addend?



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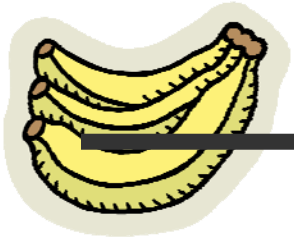
What's the Addend?



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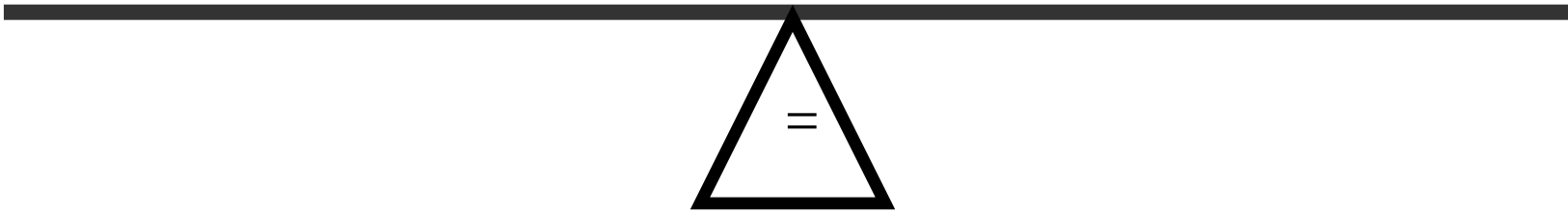
Balancing Bananas

Is the same as…



Number Sentence

Balancing Bananas

Materials for each pair of students:
"Balancing Bananas" cards
36 two-color counters
Student Resource 6a
Dry erase marker
Eraser (tissue)

Directions:

1. Place the cards in separate piles by color and facedown.
2. Partner #1 will take 1 card from each pile and flip them over. Place the cards on opposite sides of the balance.
3. Partner #2 will count on from the given number of bananas up to the sum using counters.
4. Partner #1 will write a number sentence that represents what's happening on the balance.
5. Switch roles and repeat steps 1-4.

Balancing Bananas

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36 two-color counters
Student Resource 6a
Dry erase marker
Eraser (tissue)

Directions:

1. Place the cards in separate piles by color and facedown.
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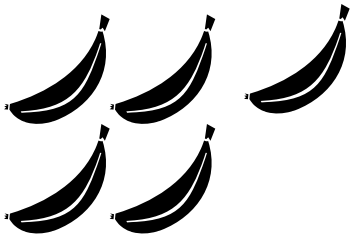
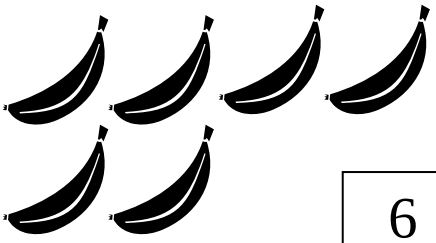
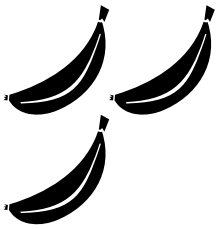
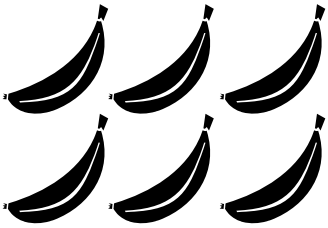
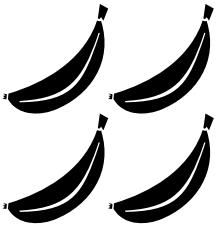
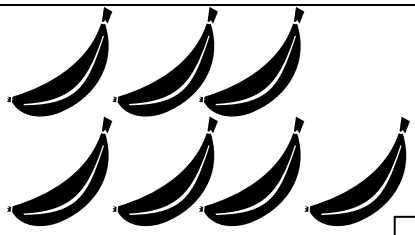
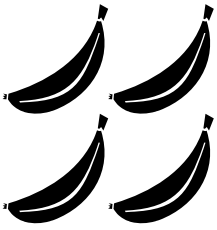
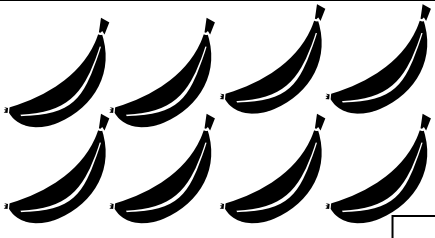
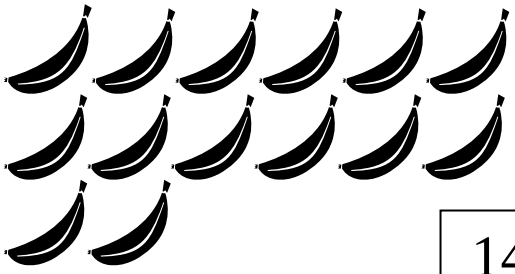
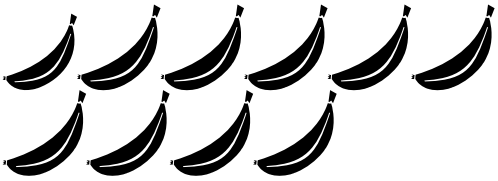
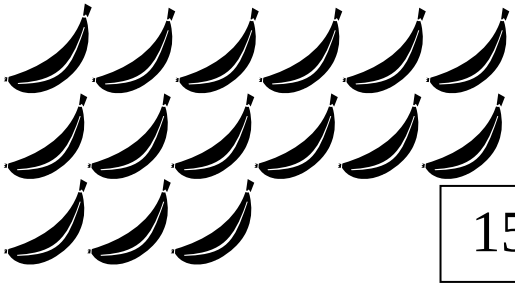
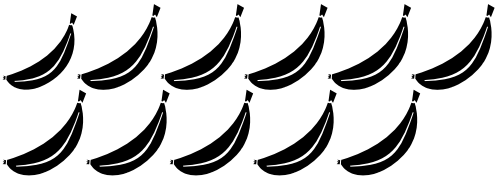
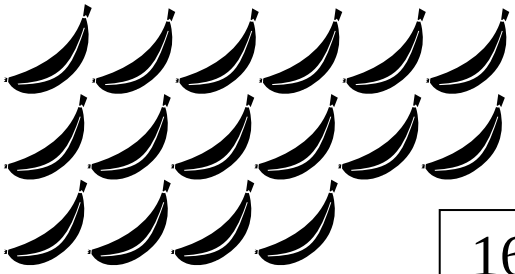
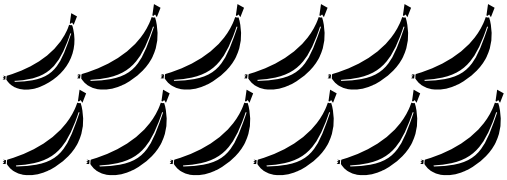
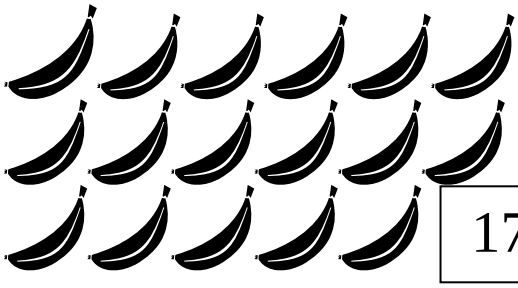
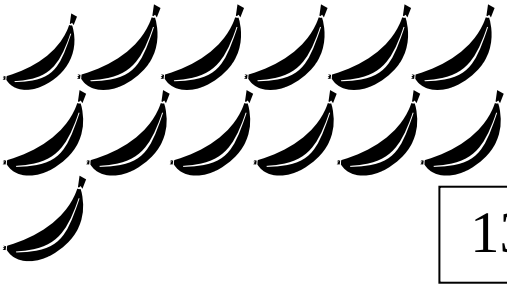
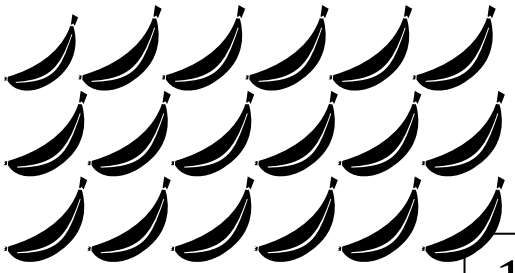
Balancing Bananas Cards

Copy on color #1 paper and cut apart.

 1	 5
 2	 6
 3	 6
 4	 7
 4	

Balancing Bananas Cards

Copy on color #2 paper and cut apart.

 9	 14
 10	 15
 11	 16
 12	 17
 13	 18

Banana Solve and Swap
Student Directions

1. Take your banana card to a partner.
2. Solve each other's banana card.
3. Show the answer on the back of the card to check your partner's work.
4. Swap your cards with each other.
5. Repeat Steps 1-4 with another partner.

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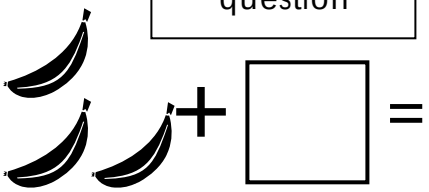
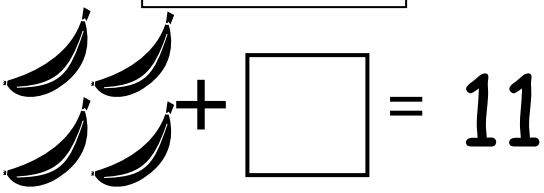
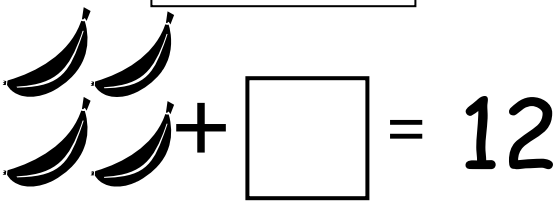
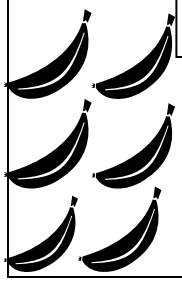
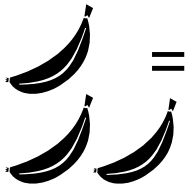
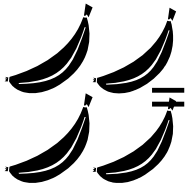
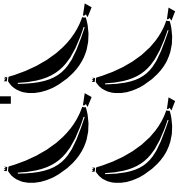
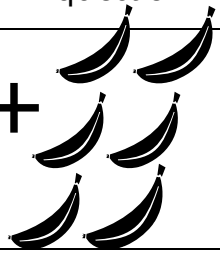
Solve and Swap Cards

Copy, fold, cut, and laminate.

question  + ☐ = 9	answer 6
question  + ☐ = 11	answer 7
question  + ☐ = 9	answer 8
question  + ☐ = 12	answer 8
question  + ☐ = 9	answer 3

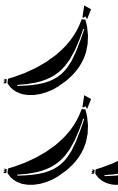
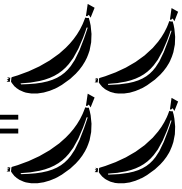
Solve and Swap Cards

Copy, fold, cut, and laminate.

question □ +  = 13	answer 10
question □ +  = 7	answer 3
question □ +  = 5	answer 4
question □ +  = 10	answer 6
question □ +  = 14	answer 8

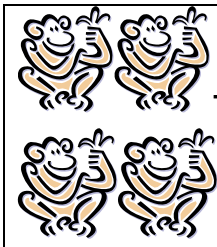
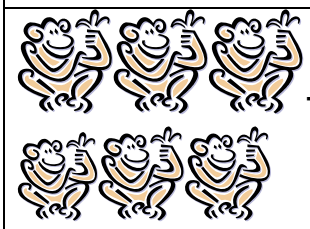
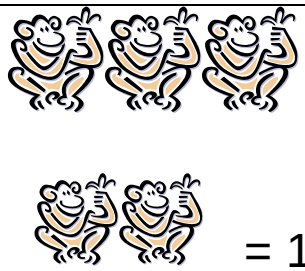
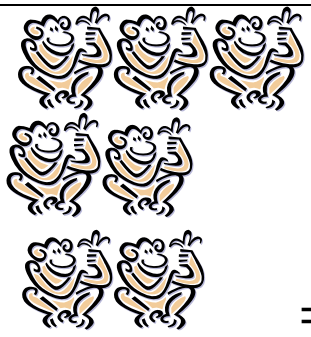
Solve and Swap Cards

Copy, fold, cut, and laminate.

question 12 =  + ☐	answer 9
question 14 =  + ☐	answer 10
question 8 =  + ☐	answer 7
question 13 =  + ☐	answer 9
question 12 =  + ☐	answer 6

Magic Monkey Machine Cards

Directions: Fold and cut. Front is pictures and back is number sentences.

 + ☐ = 7	4 + 3 = 7
 + ☐ =10	6 + 4 = 10
☐ +  = 12	7 + 5 = 12
☐ +  = 18	11 + 7 = 18

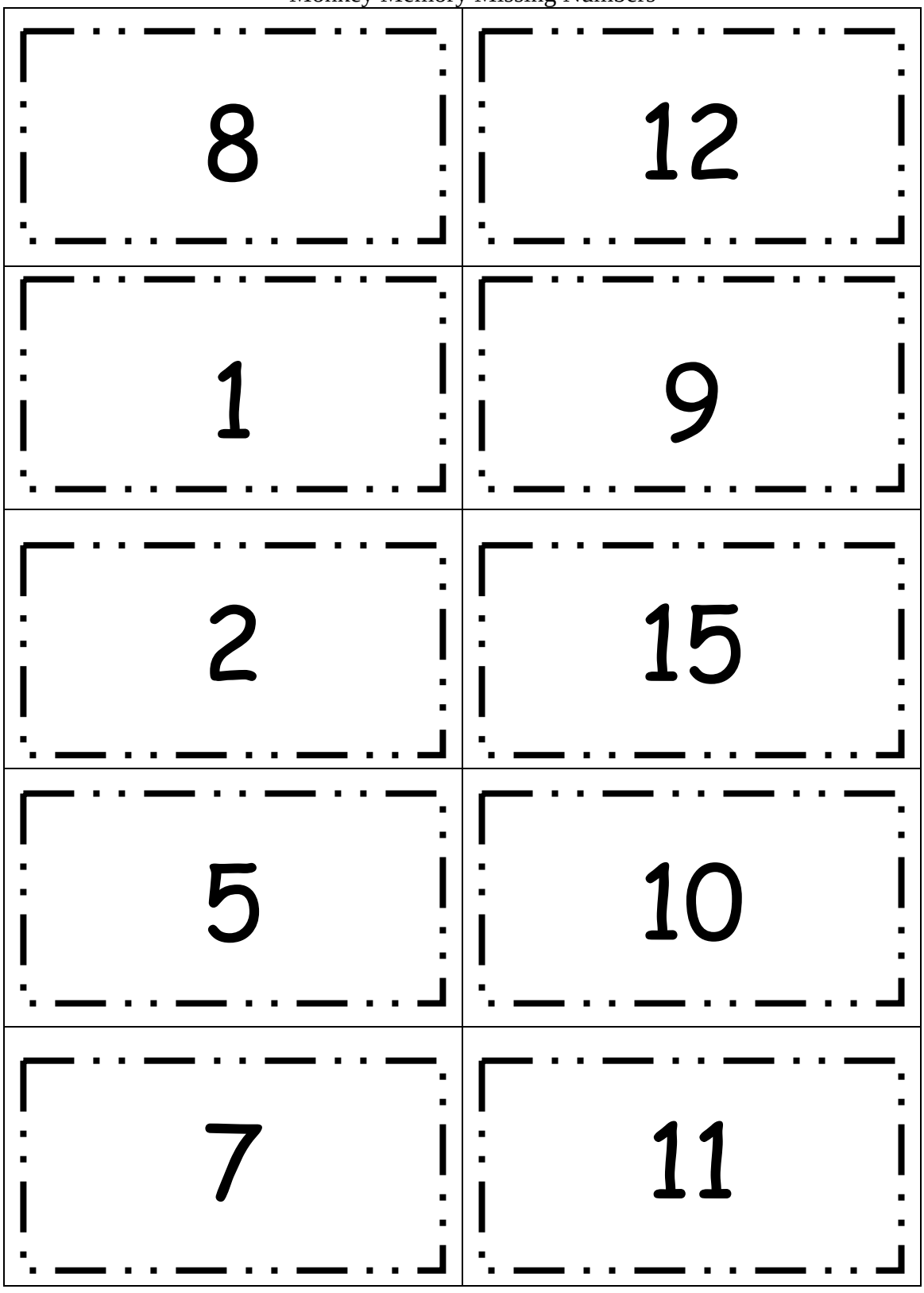
Missing Number Exploration

- 1+ ☐ = 3
- 4 = 2 + ☐
- 5 + 3 = ☐

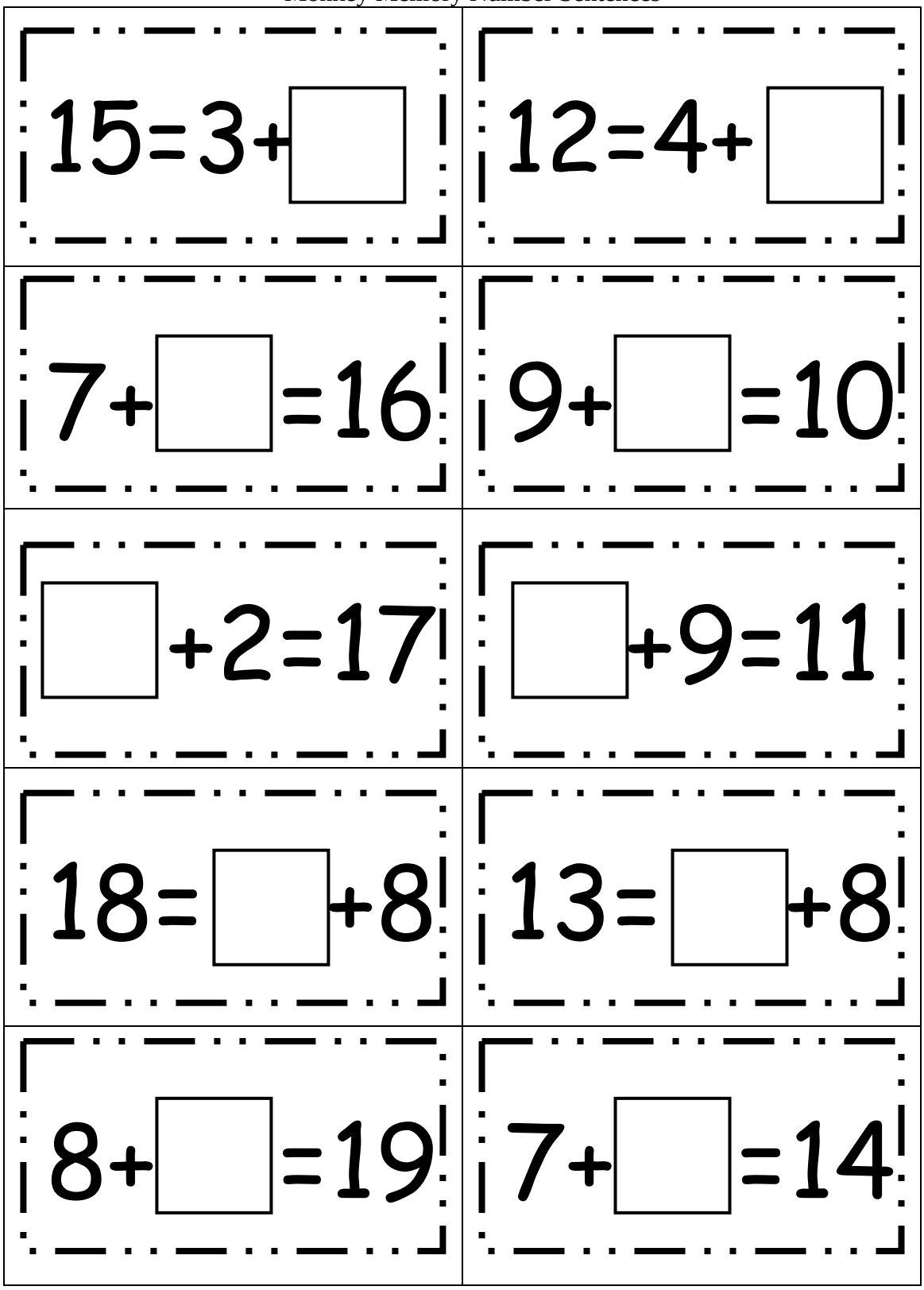
Missing Number Exploration

- 1+ ☐ = 3
- 4 = 2 + ☐
- 5 + ☐

Monkey Memory Missing Numbers



Monkey Memory Number Sentences



Missing Number Masters

4 + __ = 10 + 6

__ + 7 = 9 + 9

1 + 3 = __ + 2

5 + 8 = 6 + __

6 + __ = 9 + 8

Step A

Solve for the missing number.

_____ + 9 = 14 + 4

Step B

Use what you know about counting on to explain how you solved for the missing number. You may use words, pictures, numbers, and/or symbols in your explanation.

Missing Monkey Mystery
Summative Assessment

Name _____

1. Find the missing number.

____ + 7 =15

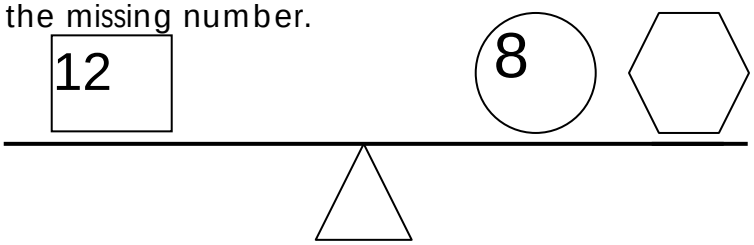
2. Find the missing number.

16 = 9 + _____

3. Trixie has 14 monkeys in one cage. She left to train the lions and when she returned there were only 5 monkeys in the cage. How many monkeys are missing?

Write a number sentence to show how you solved the problem.

4. Find the missing number.



12 = 8 + _____

5.

Step A.

Find the missing number.

5 + ___ = 13

Step B.

Use what you know about counting on to explain how you found the missing number.

_____

_____

_____

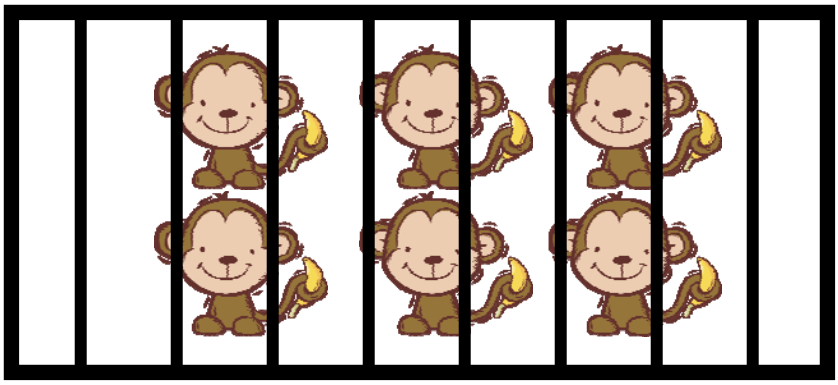
_____

_____

_____

_____

What If….?



Imagine you are watching your assigned monkey cage and you notice that there are 6 monkeys. For each problem answer the following question:

How many monkeys are missing?

1. What if there should be 10 monkeys in the cage? *4 monkeys* *4 monkeys*	2. What if there should be 12 monkeys in the cage? 6 monkeys
3. What if there should be 15 monkeys in the cage? 9 monkeys	4. What if there should be 11 monkeys in the cage? 5 monkeys

Answers to Student Resource 9, Missing Number Exploration

- 2
- 2
- 8

Answers to Student Resource 11A-B, Missing Number Masters
12

11

2

7

11

Step A = 9
Step B
14 + 4 = 18. I need to count from 9 to get to 18. 9 is 9 away from 18. 9 + 9 = 18. 14 + 4 = 9 + 9.

Answers to Student Resource 12A-B , Sample BCR
Student Resource 12A

1. 8
2. 7
3. 14 – 5 = 9 or 5 + 9 = 14

Student Resource 12 B

Step A

Solve 12 = 8+ ____
__4__

Step B

Use what you know about the count on strategy to explain how your answer is correct. You may use pictures, symbols, numbers and/or words in your explanation.

I know that 12 is the same as 8 plus something. I am going to count from 8 to 12. 9, 10, 11, 12. The answer is 4. 12 = 8 + 4.